

WHAT IS CLAIMED IS:

1. An overcurrent limit circuit comprising:

a main function part which switches a drive current for a predetermined load between ON and OFF by an ON/OFF operation  
5 of a power-MOS-FET used as a drive switch, and which drives the power-MOS-FET and protects overcurrent; and

a shunt-detection part which divides electric current applied to the drive switch from a power source side and detects the overcurrent,

10 wherein the main function part, in case that the voltage between a drain of the power-MOS-FET and a source thereof is at least less than a predetermined threshold, has a function of limiting the electric current flowing in the power-MOS-FET on the basis of the overcurrent detected by the shunt-detection  
15 part.

2. The overcurrent limit circuit according to Claim 1,

wherein the main function part further has a function of limiting the electric current flowing in the power-MOS-FET  
20 by chopping, in case that the voltage between the drain and the source of the power-MOS-FET is over the predetermined threshold.

3. The overcurrent limit circuit according to Claim 1, wherein  
25 the shunt-detection part comprises:

a shunt circuit for dividing the electric current applied to the drive switch from the power source side at a predetermined shunt ratio;

a current mirror circuit, one path of which a shunt current  
5 divided in the shunt circuit flows, and the other path of which a mirror current having a predetermined mirror ratio to the shunt current is obtained;

a constant current source being set onto the other path of the current mirror circuit;

10 the shunt circuit includes:

a sense MOS-FET, a gate and a drain of which are connected to the drive switch in common; and

a differential amplifier, to which a source voltage of the sense MOS-FET and a source voltage of the drive switch are  
15 input;

and

a detecting point of the overcurrent in the shunt-detection part is set to an intermediate point on the other path connecting the constant current source and the current  
20 mirror circuit.

4. The overcurrent limit circuit according to Claim 2, wherein the shunt-detection part comprises:

a shunt circuit for dividing the electric current applied  
25 to the drive switch from the power source side at a predetermined

shunt ratio;

a current mirror circuit, one path of which a shunt current divided in the shunt circuit flows, and the other path of which a mirror current having a predetermined mirror ratio to the  
5 shunt current is obtained;

a constant current source being set onto the other path of the current mirror circuit;

the shunt circuit includes:

a sense MOS-FET, a gate and a drain of which are connected  
10 to the drive switch in common; and

a differential amplifier, to which a source voltage of the sense MOS-FET and a source voltage of the drive switch are input;

and

15 a detecting point of the overcurrent in the shunt-detection part is set to an intermediate point on the other path connecting the constant current source and the current mirror circuit.

20 5. The overcurrent limit circuit according to Claim 1, wherein the main function part comprises:

a current limiter for limiting the current flowing in the power-MOS-FET, in case that the voltage between the drain and the source of the power-MOS-FET is over a predetermined  
25 threshold; and

a protective logic circuit for limiting the current flowing in the power-MOS-FET by shutting off or chopping the drive switch;

and

5       the main function part has a function of limiting the current flowing in the power-MOS-FET on the basis of the detection result through the protective logic circuit or the current limiter, in case that the shunt-detection part has detected the overcurrent.

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6. The overcurrent limit circuit according to Claim 2, wherein the main function part comprises:

15       a current limiter for limiting the current flowing in the power-MOS-FET, in case that the voltage between the drain and the source of the power-MOS-FET is over a predetermined threshold; and

a protective logic circuit for limiting the current flowing in the power-MOS-FET by shutting off or chopping the drive switch;

20

and

25       the main function part has a function of limiting the current flowing in the power-MOS-FET on the basis of the detection result through the protective logic circuit or the current limiter, in case that the shunt-detection part has detected the overcurrent.

7. The overcurrent limit circuit according to Claim 3, wherein  
the main function part comprises:

a current limiter for limiting the current flowing in  
5 the power-MOS-FET, in case that the voltage between the drain  
and the source of the power-MOS-FET is over a predetermined  
threshold; and

a protective logic circuit for limiting the current  
flowing in the power-MOS-FET by shutting off or chopping the  
10 drive switch;

and

the main function part has a function of limiting the  
current flowing in the power-MOS-FET on the basis of the  
detection result through the protective logic circuit or the  
15 current limiter, in case that the shunt-detection part has  
detected the overcurrent.

8. The overcurrent limit circuit according to Claim 4, wherein  
the main function part comprises:

20 a current limiter for limiting the current flowing in  
the power-MOS-FET, in case that the voltage between the drain  
and the source of the power-MOS-FET is over a predetermined  
threshold; and

a protective logic circuit for limiting the current  
25 flowing in the power-MOS-FET by shutting off or chopping the

drive switch;

and

the main function part has a function of limiting the  
current flowing in the power-MOS-FET on the basis of the  
5 detection result through the protective logic circuit or the  
current limiter, in case that the shunt-detection part has  
detected the overcurrent.